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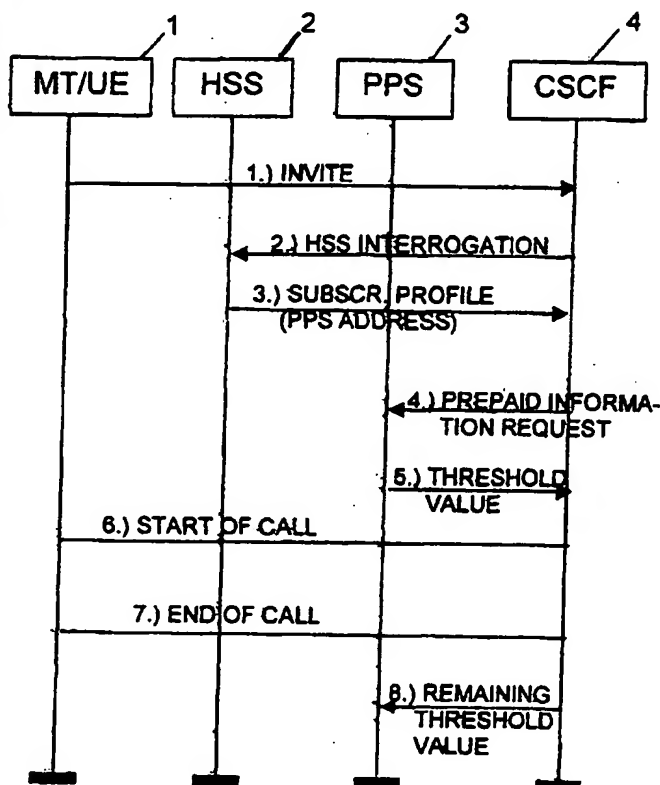
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(54) Title: METHOD AND SYSTEM ENABLING PREPAID SERVICE IN AN ALL-IP NETWORK



(57) Abstract: The invention relates to a system and method for enabling prepaid service in a packet-based communications system, in particular in an All-IP network which comprises one or more subscriber terminals. At least one subscriber database stores subscriber information including identification data of one or more server means, and the at least one server means stores prepaid accounts for subscribers. When a subscriber terminal is initiating the establishment of a connection to another network entity, the server means is adapted to transmit a subscriber-prepaid-account related value informing a control means on an available charge threshold value for the connection to be established.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**TITLE**

METHOD AND SYSTEM ENABLING PREPAID SERVICE IN AN ALL-IP  
NETWORK

5

**DESCRIPTION****FIELD AND BACKGROUND OF THE INVENTION**

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The invention relates to a method and system enabling PrePaid service in an All-IP network.

Customary networks provide proper charging of calls in a  
15 standardized manner. In recent years, Prepaid solutions are offered in which subscribers are paying money in advance to an account from which call charges or other types of telecommunication charges of the respective subscriber are subsequently deducted. The account is usually stored in a  
20 prepaid telephone card or in an IN (Intelligent Network) system in the telecommunications network.

However, in an All-IP network in which the call originating and terminating equipments as well as any intermediate  
25 network elements are addressed using their IP addresses, no PrePaid service is presently implemented because of technical difficulties.

30

**SUMMARY OF THE INVENTION**

The present invention provides a method and/or system as defined in the independent claims or any of the dependent  
35 claims.

35

In particular, the invention provides a method and system for enabling prepaid service in a packet-based communications system which comprises one or more subscriber terminals, at least one subscriber database storing subscriber information, and at least one server means storing prepaid accounts for subscribers, the subscriber information stored in the subscriber database for the subscriber(s) including the identification data, for example name and/or address of the server means, wherein, when a subscriber terminal is initiating the establishment of a connection to another network entity, the server means is accessed and returns a subscriber-prepaid-account related value informing on an available charge threshold value for the connection to be established.

Further, the invention proposes network elements as defined in claims 17, 18.

According to the present invention, the PrePaid problem is solved by providing an additional network node, in the following also called PrePaid Server (PPS) which preferably is a network-external server.

The PrePaid Server PPS serves for implementing prepaid services in All-IP networks. The PrePaid server (PPS) takes care of on-line subscriber billing per call basis. PPS may be provided by a bank or other financial institution. The subscriber(s) will make a contract with PPS provider. The contract is made known to subscriber's operator and the identification data, e.g. address and/or name of the PPS is stored to subscriber's profile in a subscriber database such as Home Subscriber Server (HSS).

Authentication may be performed in CPS/HSS (Call Processing Server/Home Subscriber Server). The authorization may be made

prerequisite for usage of PPS. For each subscriber there is defined, in his/her stored profile, the PPS to be used.

5 As the proper handling and implementing of prepaid service is becoming more and more complicated due to fragmented networks the prepaid servers may form part of one or more networks so that a new network architecture is provided. The use of the PrePaid Server in the network(s) is appropriately defined.

10 Subscriber(s) can have one or more prepaid servers PPS in use. These servers "hide" whatsoever applications are used in transactions and enable a reasonable way to implement prepaid service. Server(s) also enable(s) on-line charging towards different applications.

15

#### BRIEF DESCRIPTION OF THE DRAWINGS

20 Fig. 1 illustrates a first embodiment of the present invention, and

Fig. 2 shows a second embodiment of the present invention.

25

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

30 Fig. 1 illustrates a first embodiment which may be considered as a basic case, comprising a PPS 3 and making usage of PPS 3 in a Core network without using SCE (Service Creation Environment). As shown in Fig. 1, a mobile terminal or user equipment (MT/UE) 1 can communicate with one or more Call State Control Functions (CSCF) 4. A subscriber database such  
35 as HSS 2 stores basic subscriber information including

identification data, for example name(s) or address(es), preferably IP addresses, of one or more PPS server(s) 3 assigned to the subscriber or MT/UE 1 (Mobile Terminal / User Equipment).

5

For initiating a call or connection of other type, MT/UE 1 may perform a normal SIP INVITE operation to the CSCF (Call State Control Function) 4 by sending INVITE message 1.). The INVITE operation is part of SIP (Session Initiation Protocol), a signalling protocol for IP based communications, which is defined by IETF. CSCF 4 loads the subscriber profile from the HSS (Home Subscriber Server) 2 by performing a HSS interrogation 2.). The HSS 2 returns message 3.), i.e. the subscriber profile data including PPS info, e.g. PPS address. In a next step 4.), CSCF 4 addresses PPS 3 and requests Prepaid information for the subscriber 1 initiating the session. PPS 3 returns a message 5.) indicating the actual threshold value (actually remaining prepaid amount still to be used) of the subscriber in question. Thereupon, the session, e.g. call is started, step 6.), provided that the threshold value is sufficient for initiating the session. When the call ends as indicated by 7.), CSCF 4 calculates the session charges and deducts these from the threshold value received in step 5.). The remaining threshold value is returned (message 8.) to PPS 3 as now valid threshold value. PPS 3 decreases subscribers account correspondingly and transfers the used amount of money to operator's account.

Fig. 2 illustrates a further embodiment wherein PPS is used with SCE (Service Creation Environment). The access and core networks are separated, and an external service is used.

The steps performed according to Fig. 2 are explained below with reference to the step numbers attached to the information flows shown in Fig. 2.

- 1.) A GPRS access network 11 (e.g. SGSN, Serving GPRS Support Node, of the GPRS network) triggers to a first Service Creation Environment element (SCE1) 12. The trigger message sent in step 1.) includes the identification data, e.g. IP address, of PPS 14, a CIE (Charging Information Element) element as well as an identity of the access network.
- 10 It should be noted that while GPRS terminal UE (User Equipment) 10 has made the GPRS attach request or update before performing step 1.), the profile of subscriber (including name and/or address, e.g. IP address, of PPS 14) has been downloaded to SGSN from HSS 13. So the PPS 14 identity is already known in this phase. Call related global charging\_ID is included in the CIE (Charging Information Element) element as well as identity of the access network.
- 20 2.) SCE1 12 requests prepaid information from PPS 14 and delivers CIE to PPS 14. Global Charging\_ID is linked to subscriber temporary "virtual" account in PPS 14. Access network identity is stored into PPS for billing purposes.
- 25 3.) PPS decreases the subscribers account with suitable share, calculates a resulting threshold value and returns this threshold value to SCE1 12. This share can be counted or calculated from parameters included in CIE element (e.g. basic GPRS access fee) for example so that the threshold value will be enough e.g. for five minutes connection.
- 30 Alternatively, the PPS 14 may simply return the presently stored actual amount of the prepaid account to the SCE1 12.
- 4.) SCE1 12 returns the received threshold value to the GPRS 11. It is up to GPRS 11 to request a further threshold value or clear the connection if threshold value is used up.

Note that SCE1 12 may offer value added services in GPRS level. If this is so it has to charge these value added services separately by sending or adding a one-time charge request towards PPS or requesting a charge of combined fee (using CIE in both cases). It should also be noted that the SCE1 12 (as well as an additional second Service Creation Environment SCE2 15) may also be used for internal services only. If those services are not used the connection could be made straight from GPRS network (e.g. SGSN) 11 to PPS 14.

5. The UE 10 sends a message, e.g. an INVITE message, to CSCF 16 (including Global Charging\_ID).

6.) The CSCF 16 performs an HSS 13 interrogation.

7.) The HSS 13 returns subscriber's profile data (including PPS information) to the CSCF 16.

8.) CSCF 16 triggers to SCE2 15, and transfers the Global Charging\_ID to SCE2.

9.) SCE2 15 requests prepaid information from PPS 14. CIE is delivered to PPS 14 (basic tariffing is made in the SCE2 or in CPS, Call Processing Server). Global Charging\_ID is linked to subscriber temporary "virtual" account, and Core network identity is stored for billing purposes.

10.) PPS decreases the subscribers account with suitable share and calculates or gives the threshold value. This share may be counted from parameters included to CIE element (e.g. basic core network fee) for example so that the threshold value will be enough for e.g. five minutes connection. Alternatively, the PPS 14 may simply return the presently stored actual amount of the prepaid account to the SCE2 15.



11.) SCE2 15 returns the value to the CSCF 16. In CSCF 16, the threshold value is decreased according to charging parameters. If tariffing is done in the SCE2 15, the CIE  
5 element is returned with the remaining threshold value.

It should be noted that, similar to the explanations regarding SCE1 and step 4.), SCE2 15 may offer value added services in core network level. If it is so it has to charge  
10 these services separately by adding a one-time charge request towards PPS 14 or charging a combined fee (using CIE in both cases). It should also be noted that the SCE2 (as well as SCE1) may be used only for internal services. If those services are not used the connection could be made from CSCF  
15 16 straight to PPS 14.

Thereafter, the call/connection is started, as indicated by the horizontal solid line.

20 The CSCF 16 takes care of threshold value decreasing in core network level and SGSN in the GPRS network level. If more credit is needed, it has to be requested from PPS 14 according to steps 1-4 in core network and/or steps 8-11 in GPRS network.

25

12.) External service 17 is requested. It should be noted that the external service may also be PSTN network, ISP (Internet Service Provider) or any other service located outside of the core network. This request will include Global  
30 Charging\_ID.

13.) External service 17 returns CIE element with charging parameters (fee of the service etc.) and identification of the server.

35

14.) CSCF 16 requests new threshold value for the service from SCE2, and includes CIE with above mentioned parameters in this request.

5        15.) SCE2 15 requests new threshold value from PPS 14. CIE with above mentioned parameters is included in the request. PPS 14 stores the identity of the service. A check as to whether or not the subscriber is allowed to use identified service may be performed in the SCE2 15 or in the  
10 PPS 14.

16.) A new threshold value is returned from PPS 14 to SCE2 15.

15        17.) SCE2 15 returns the new threshold to CSCF 16.

When the call/connection is to be terminated, the call/connection is cleared ("End of call").

20        18a., 18b.) The remaining threshold value is returned to SCE1 12 and SCE2 15.

19a., 19b.) The remaining threshold value is returned to PPS 14. PPS 14 increases the subscribers account with these  
25 values. PPS 14 transfers the fees of the usages of the access network, core network and external service to corresponding accounts.

The PPS 3, 14 thus contains, or has access to, a database of  
30 the allowed services (address/name/identity) per PPS, subscriber, and maybe per subscriber account. Towards these services PPS is preferably able to transfer money from the subscribers account, e.g. after having received respective charging information from CSCF 4, 16.

35

The HSS 2, 13 has the identification data, for example address and/or name of the subscribers' PPS in the subscribers' profile.

- 5 The CSCF 4, 16 can count the price of each service separately according to received CIEs. It also takes care of producing CDRs (Charging Data Records) from the call. If pure prepaid is used, the CDRs are stored just for checking/legal purposes. If shared charging occurs, the CSCF settles or  
10 calculates the charges and informs SCE(s) (PPS) accordingly.

The SCE 12 and/or 15 can be adapted to include basic tariff information. It is preferably also capable to offer different services which affect charging parameters.

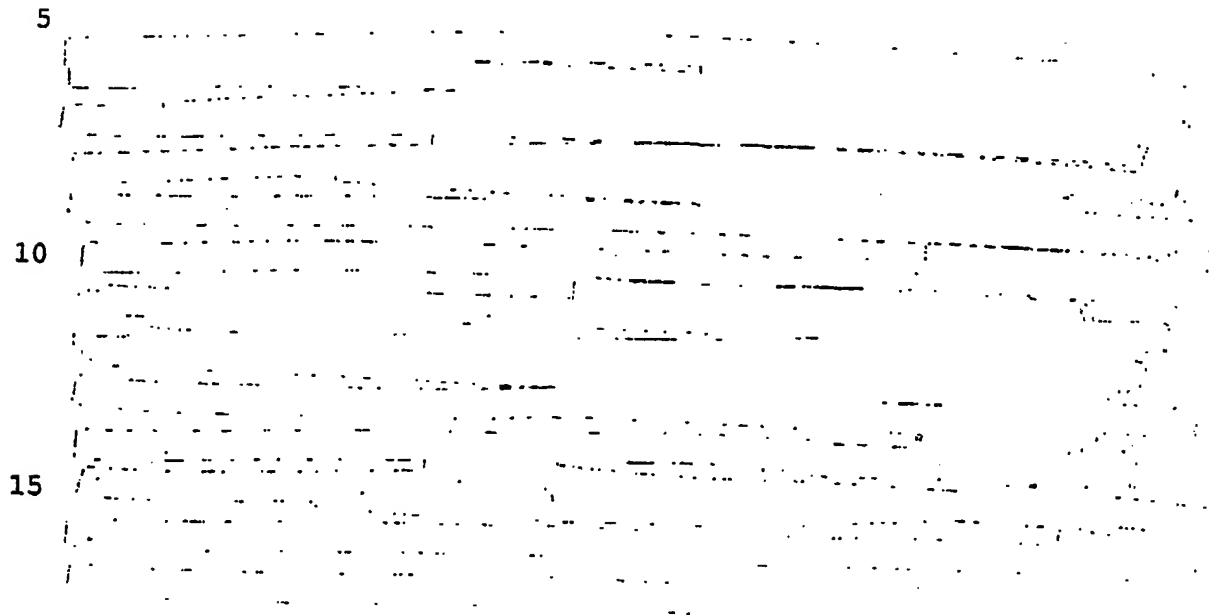
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- With the provision of PPS, it is possible to introduce on-line prepaid charging and also AoC (Advise of Charge) to terminal. It is also possible that subscriber can have on-line account checking from PPS. This feature leaves network  
20 operating to network operator and releases it from financing. Postpaid billing scenario is not necessary and no longer needed.

- The PPS server is not necessarily an operator node. For  
25 instance, if some or all teleoperators prefer to be prepaid and thus do not have to act as a bank, subscribers will possibly make a kind of direct charging agreement with the operator that is part of subscriber information. PPS may then preferably be adapted to take care of charging, checking the  
30 used services and taking care of account balance. This server can be e.g. a bank server, which distributes the money between access and core operators and different service providers. In an All-IP network, a huge number of different service providers can exist. The subscriber will  
35 advantageously not have to pay several different small

accounts but only have to pay on one PPS controlled account.

Although the invention has been described above with  
reference to specific embodiments, the invention intends to  
5 cover other embodiments as well which represent combinations  
of the above features, omissions, amendments, alternatives  
etc.



## CLAIMS

5           1. Method for enabling prepaid service in a  
communications system which comprises one or more subscriber  
terminals, at least one subscriber database means storing  
subscriber information, at least one server means storing  
10 prepaid accounts for subscribers, and at least one control  
means for controlling a connection from a subscriber terminal  
to another network entity, the subscriber information stored  
in the subscriber database means for the subscriber(s)  
including identification data of the server means, wherein,  
when a subscriber terminal is initiating the establishment of  
15 a connection to another network entity, a request is sent to  
the server means which in response thereto transmits, to the  
control means, a subscriber-prepaid-account related value  
informing on an available charge threshold value for the  
connection to be established.

20

2. Method according to claim 1, wherein the control  
means receives a charge threshold value from the server means  
when establishing a connection from the subscriber terminal,  
the control means deducting the actual charge of the  
25 connection from the threshold value and returning a remaining  
charge value to the server means after termination of the  
connection.

3. Method according to claim 1 or 2, wherein the control  
30 means is a CSCF (Call State Control Function).

4. Method according to claim 1, 2 or 3, wherein, when a  
subscriber terminal is initiating the establishment of a  
connection to another network entity, the subscriber database  
35 means is accessed for reading out the identification data of

the server means which identification data are subsequently transmitted to the control means, the control means sending the request to the server means identified by the identification data.

5

5. Method according to any one of the preceding claims, wherein the network is an All-IP network

6. Method according to any one of the preceding claims,  
10 wherein at least one Service Creation Environment (SCE) element is provided for communicating with the server means.

7. Method according to claim 6, wherein the SCE element  
15 is informing the server means on the charges of a used service.

8. Method according to any one of the preceding claims,  
wherein the subscriber database means is a Home Subscriber  
20 Server (HSS).

9. System for enabling prepaid service in a  
communications system which comprises one or more subscriber  
terminals, at least one subscriber database means storing  
subscriber information, at least one server means storing  
25 prepaid accounts for subscribers, and at least one control  
means for controlling a connection from a subscriber terminal  
to another network entity, the subscriber information stored  
in the subscriber database means for the subscriber(s)  
including identification data of the server means, wherein,  
30 when a subscriber terminal is initiating the establishment of  
a connection to another network entity, the server means is  
adapted to transmit, in response to a request sent to the  
server means, a subscriber-prepaid-account related value to  
the control means informing the control means on an available  
35 charge threshold value for the connection to be established.

10. System according to claim 9, wherein the server means is adapted to send a charge threshold value to the control means when a connection is to be established from the subscriber terminal, the control means being adapted to deduct the actual charge of the connection from the threshold value and to return a remaining charge value to the server means after termination of the connection.
11. System according to claim 9 or 10 wherein the control means is a CSCF (Call State Control Function).
12. System according to claim 9, 10 or 11, wherein the subscriber database means is adapted to transmit the identification data of the server means to the control means when a subscriber terminal is initiating the establishment of a connection to another network entity, the control means being adapted to send the request to the server means identified by the identification data.
13. System according to any one of the preceding system claims, wherein the network is an All-IP network
14. System according to any one of the preceding system claims, wherein at least one Service Creation Environment (SCE) element is provided for communicating with the server means.
15. System according to claim 14, wherein the SCE element is adapted to inform the server means on the charges of a used service.
16. System according to any one of the preceding system claims, wherein the subscriber database means is a Home Subscriber Server (HSS).

17. Network element for use in a method according to any one of claims 1 to 8, or for use in a system according to any one of claims 9 to 16, the network element including a
- 5 subscriber database means storing subscriber information for the subscriber(s), the subscriber information stored in the subscriber database including identification data of at least one server means storing prepaid accounts for subscribers.
- 10 18. Network element for use in an All-IP network, in particular for use in a method according to any one of claims 1 to 8, or for use in a system according to any one of claims 9 to 16, the network element being a server means storing prepaid accounts for subscribers.

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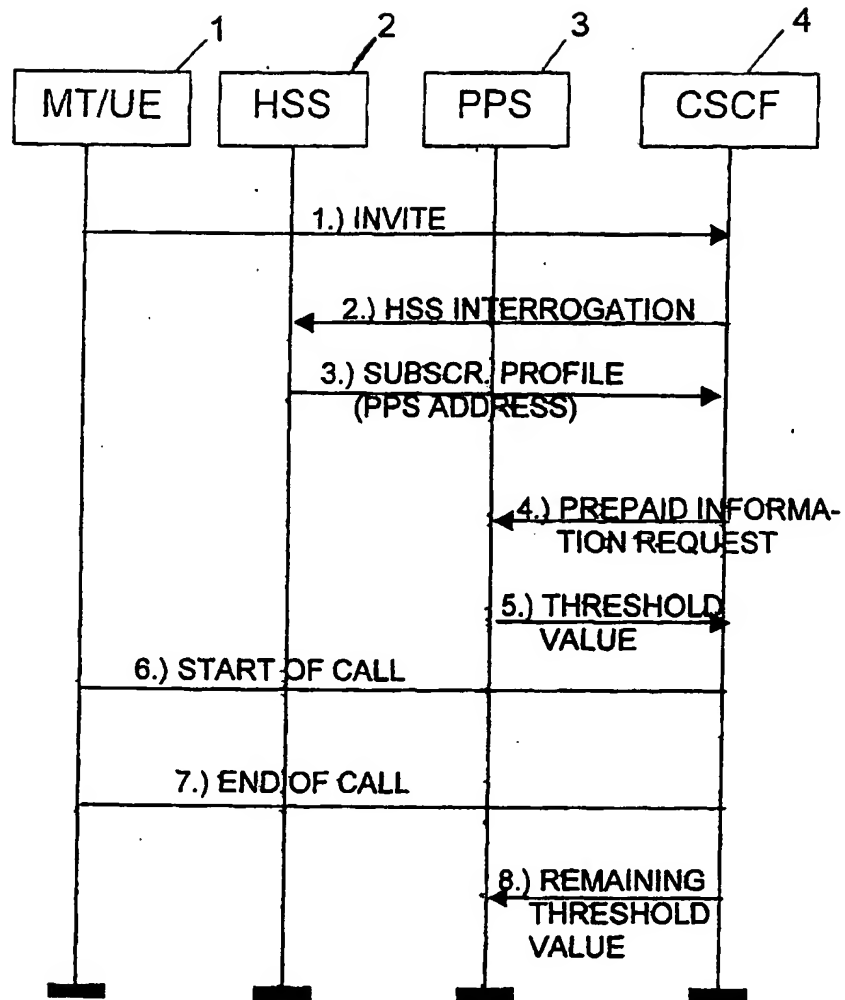
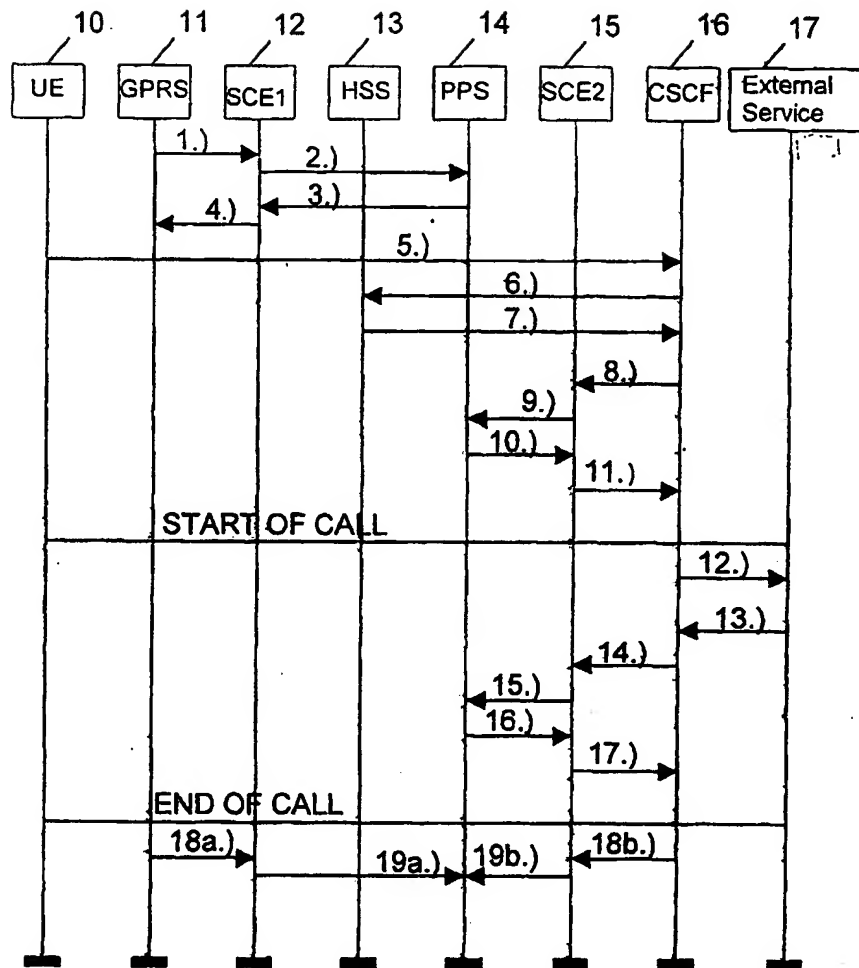


FIG. 1

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**FIG. 2**

# INTERNATIONAL SEARCH REPORT

Int. Application No.  
PCT/EP 00/13248

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 H04M17/00 H04L12/14 G07F7/08 G07F7/10

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 H04M H04L G07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 921 487 A (M P TECHNOLOGY INC ;NIPPON TELEGRAPH & TELEPHONE (JP)) 9 June 1999 (1999-06-09) claim 1; figure 1 column 13, line 10 - line 23 column 14, line 2 - line 18 column 10, line 44 -column 11, line 7	1,2,5,9, 10,13, 17,18
A	US 5 905 736 A (RONEN YZHAK ET AL) 18 May 1999 (1999-05-18)  claim 1	1,2,5,9, 10,13, 17,18
A	WO 00 24161 A (NOKIA NETWORKS OY ;WALLENUS JUKKA (FI)) 27 April 2000 (2000-04-27) page 8, line 17 -page 10, line 4	1,2,9, 10,13, 17,18

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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# INTERNATIONAL SEARCH REPORT

Int. Application No  
PCT/EP 00/13248

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 00 02374 A (ERICSSON TELEFON AB L M) 13 January 2000 (2000-01-13) claims 1-12	1-18

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/13248

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0921487	A	09-06-1999	JP 11316729 A	16-11-1999
US 5905736	A	18-05-1999	AU 2200397 A	12-11-1997
			WO 9740615 A	30-10-1997
WO 0024161	A	27-04-2000	FI 982748 A	20-04-2000
			AU 6343999 A	08-05-2000
			EP 1123606 A	16-08-2001
WO 0002374	A	13-01-2000	FI 981553 A	07-01-2000
			AU 4778399 A	24-01-2000
			GB 2354675 A	28-03-2001

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